Message

From: Matt Tonkin [matt@sspa.com]
Sent: 4/6/2018 1:29:02 PM
To: G D Beckett [g.d.beckett@aquiver.com]; Grange, Gabrielle Fenix [Gabrielle.Grange@doh.hawaii.gov]; Robert.Whittier@doh.hawaii.gov; TU, LYNDSEY [Tu.Lyndsey@epa.gov]
Subject: RE: Red Hill Modeling

In this regard as well: I think the boundaries (up and down gradient) can affect the overall average gradient for certain throughout the domain, but we would likely need unrealistic adjustments to one or both of them to match the local gradients – I have pondered this for a while, and I think adjustment to the upgradient boundary is going to be appropriate for lower recharge conditions, etc., but it wont achieve much improvement in local fit. That comes from the local geology, and I think the "clinker" sensitivity run showed some potential there in terms particularly of gradient change. But it was grossly simplified, and in reality based on our developing CSM, it is very unlikely to be a single connected clinker such as they modeled, that causes the local gradients, but the sum-total of the connected flow paths be they unweathered clinker zones, or fractures, or both, that results in this condition. So the clinker sensitivity run was illustrative but not explanatory.

One other thought: it is of course the combination of aquifer properties and flux that leads to the gradient – so a low gradient need not necessarily represent very high flux in a very highly transmissive unit/sequence – it could also represent much less flux in a unit that for whatever reason is bypassed because there are better avenues for flow and migration. This possibility also exists, and I want to be sure not to forget it for my part, in case the path is actually sneaking around us before our very eyes.

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From: G D Beckett [mailto:g.d.beckett@aquiver.com]
Sent: Thursday, April 5, 2018 7:03 PM
To: Grange, Gabrielle Fenix <Gabrielle.Grange@doh.hawaii.gov>; Robert.Whittier@doh.hawaii.gov; TU,LYNDSEY <tu.lyndsey@epa.gov>; Matt Tonkin <matt@sspa.com>
Subject: Re: Red Hill Modeling

Thanks Bob, I agree. I brought this issue up w/Sorab during our meeting a couple weeks ago, where the high K case has some of the best residuals of any iteration and better align with a Dupuit evaluation of shaft drawdowdn v. pumping rate. A coincident realignment of the boundary assumptions may well produce much better model results. However, even so, I don't think it would solve the transport issues we'll arrive at pretty soon. But it might better explain the overall flow regime.

Best regards.

>>> Whittier, Robert<Robert.Whittier@doh.hawaii.gov> 4/5/2018 5:48 PM >>>

Hi All,

Since we are on the topic the groundwater model, I feel that NE (mauka) and the SW (coastal/submarine) boundaries so constrain the model as to limit range of outcomes regardless of perturbations done for the sensitivity analysis. It is something I am still working on, but is something all should be considering. We can discuss further tomorrow.

BOb W>

From: G D Beckett <g.d.beckett@aquiver.com>
Sent: Thursday, April 5, 2018 12:30 PM
To: Donald Thomas; G D Beckett; Grange, Gabrielle Fenix; TU,LYNDSEY; Whittier, Robert; matt@sspa.com
Subject: RE: Red Hill Modeling

I'll just simple add this is precisely why we want/need the Navy's synoptic db of water level gauging, among many other similar elements. No cogent analysis can be completed on these one-off data sets. We can surmise that the Navy & Sorab must have these; Matt by your response I'll presume you were not able to find synoptic digital working data for the comprehensive well array in the Navy's data submittal on the 13th?

To me, we're sort of still on the outside looking in. We have some insights, but absent comprehensive working data, we cannot (or at least me) come up with a comprehensive independent CSM that will then elucidate the actual key questions of concern w-r-t transport, as opposed to what the Navy feeds us.

Best regards.

G.D. Beckett, RG, CHg
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>>> Matt Tonkin<matt@sspa.com> 4/5/2018 2:55 PM >>>
Don, this just came to me, not the group – so I have added them on a reply here.

I had some similar questions about the data – definitely it seems that on the November data set the gradient is not seaward – a couple of the others seem essentially flat or without structure, and a couple seem to have a component that is mauka to makai. It looks like pumping at RHS is a significant factor in the mauka to makai data sets, and absent that it is flat/noisy/indeterminate. Certainly, it does suggest there is not a persistent and uniform mauka to makai gradient, which is what the base-case model indicates: it may be that it is highly variable but low-valued and so close to indeterminate. It interested me that the clinker-zone sensitivity case gave a better match to the gradients (at least, the flatness of them) in this area, and though it may not be a transmissive clinker zone that is the cause, something appears to be.

I do think there is a great role here for convolution, and I may try it with this data set because it looks ripe for it, on the face of it. I am curious if there are similarly frequently monitored levels in wells 02 and 03?

Thanks,

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From: Donald Thomas [mailto:dthomas@soest.hawaii.edu]
Sent: Thursday, April 5, 2018 3:43 PM
To: Matt Tonkin <matt@sspa.com>
Subject: Re: Red Hill Modeling

Hi Bob,

Have been looking at your graphs and have some questions but want to start out with a really stupid one:

You wrote that "The resulting gradient was 0.2 ft/mi going to the northeast or mauka." Is that increasing or decreasing to the northeast - and is there a convention when you refer to a gradient?

On to a simple clarification: in the mauka/makai water level plots, have you gone back and corrected the TOC for the earlier measurements?

Are these routinely done on the same day? Have you gotten the synoptic monitoring data to see what the "normal" change rate is in the water levels (I know that the raw synoptic data includes barometric pressure changes that need to be removed - do they do that before providing the data or is that something we would need to do?)

Looking at your plots, my brain instantly seizes up - too much happening simultaneously over too broad an area for me to come up with anything approaching a conceptual model for how these wells are responding to rainfall and pumping. Would really like to see some long term water level measurements (simultaneously in multiple wells) to try to make sense of what is going on.

Don

On 4/5/2018 8:28 AM, Matt Tonkin wrote:

> Bob:
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> Thanks for this update, the timing is very important - is there any chance you have and could share those recent data and the plot that you made?
>
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From: Whittier, Robert [mailto:Robert.Whittier@doh.hawaii.gov]
Sent: Thursday, April 5, 2018 1:25 PM
To: TU, LYNDSEY <Tu.Lyndsey@epa.gov>; Grange, Gabrielle Fenix <Gabrielle.Grange@doh.hawaii.gov>; Matt Tonkin <matt@sspa.com>; g.d.beckett@aquiver.com; Donald Thomas <dthomas@soest.hawaii.edu>
Subject: Red Hill Modeling

Hi Lyndsey and All,

On Monday I received the latest Oil/Water Interface Report. As I normally do I plotted the water table elevations for the tunnel wells (i.e. RHMW03, RHMW02, RHMW01, and RHMW05). This is a line of wells that covers a mauka to makai distance of about 0.45 mi. The resulting gradient was 0.2 ft/mi going to the northeast or mauka. This implies the groundwater flow direction beneath the USTs that is exactly opposite of the flow direction simulated by the latest Red Hill groundwater flow model. I don't think this discrepancy has been adequately explained in spite of being brought up repeatedly. It appears from the proposed agenda that we moving from the groundwater flow model to the fate and transport model. Since the fate and transport model relies on the groundwater flow model, moving on to the fate and transport model seems premature.

Thanks,

Bob W.

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